NON-PUBLIC?: N
ACCESSION #: 9011200001
LICENSEE EVENT REPORT (LER)

FACILITY NAME: PLANT HATCH, UNIT 1 PAGE: 1 OF 6

DOCKET NUMBER: 05000321

TITLE: MANUAL SCRAM DUE TO MAIN TURBINE HIGH VIBRATION
EVENT DATE: 10/15/90 LER #: 90-021-00 REPORT DATE: 11/08/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 070

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 10/15/90 at approximately 1507 CDT, Unit 1 was in the Run mode at an approximate power of 1698 CMWT (approximately 70% rated thermal power). At that time, the unit was manually scrammed due to high vibration of the Main Turbine (EIIS Code TA). Following the manual scram, reactor vessel water level decreased as expected due to void collapse caused by the rapid power reduction. This resulted in a redundant Reactor Protection System (EIIS Code JC) actuation, a Group 2 Primary Containment Isolation System (PCIS, EIIS Code JM) isolation signal on low water level (Level 3), and closure of Group 2 Primary Containment Isolation Valves (PCIVs). The Reactor Feedwater Pumps (RFPs, EIIS Code SJ) and the Reactor Core Isolation Cooling (RCIC, EIIS Code BN) System were used to restore and maintain reactor vessel water level. Reactor pressure was controlled by the Turbine Bypass Valves (EIIS Code JI).

The cause of the Main Turbine high vibration has not been determined. A potential cause was the closure of Reheat Steam Source Valves (RSSVs, EIIS Code SB) 1N38-F101A and B to the second stage Moisture Separator Reheater (MSR, EIIS Code SB). Closure of the RSSVs would cause a rapid drop in the temperature of the low pressure turbine inlet steam and could result in movement of the low pressure turbine rotor in relation to the turbine shell as the two bodies of metal cooled at different rates. This could cause rubbing in the shaft seal area and an increase in main turbine vibration. The cause for RSSV closure has not been determined. All possible causes were investigated but no actual failure was revealed. Corrective actions include disabling a switch which can cause RSSV closure and correcting a drawing error.

END OF ABSTRACT

PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor
Energy Industry Identification System codes are identified in the text as (EIIS Code XX)

SUMMARY OF EVENT

On 10/15/90 at approximately 1507 CDT, Unit 1 was in the Run mode at an approximate power of 1698 CMWT (approximately 70% rated thermal power). At that time, the unit was manually scrammed due to high vibration of the Main Turbine (EIIS Code TA). Following the manual scram, reactor vessel water level decreased as expected due to void collapse caused by the rapid power reduction. This resulted in a redundant Reactor Protection System (EIIS Code JC) actuation, a Group 2 Primary Containment Isolation System (PCIS, EIIS Code JM) isolation signal on low water level (Level 3), and closure of Group 2 Primary Containment Isolation Valves (PCIVs). The Reactor Feedwater Pumps (RFPs, EIIS Code SJ) and the Reactor Core Isolation Cooling (RCIC, EIIS Code BN) System were used to restore and maintain reactor vessel water level. Reactor pressure was controlled by the Turbine Bypass Valves (EIIS Code JI) which operated to control pressure at a maximum value of approximately 943 psig.

The cause of the Main Turbine high vibration has not been determined. A potential cause was the closure of Reheat Steam Source Valves (RSSVs, EIIS Code SB) 1N38-F101A and B to the second stage Moisture Separator Reheater (MSR, EIIS Code SB). Closure of the RSSVs would cause a rapid drop in the temperature of the low pressure turbine inlet steam and could result in movement of the low pressure turbine rotor in relation to the

turbine shell as the two bodies of metal cooled at different rates. This could cause rubbing in the shaft seal area and an increase in main turbine vibration. The cause for RSSV closure has not been determined. All possible causes were investigated but no actual failure was revealed. The RSSVs could have potentially closed as the result of an incorrectly labeled switch in the Unit 1 Turbine Building (EIIS Code NM) being repositioned. The switch was labeled incorrectly because of an error in a plant drawing. However, repositioning was not confirmed.

Corrective actions include disabling the switch wiring, as its function is no longer required, and correcting a drawing error which contributed to the switch being mislabeled.

DESCRIPTION OF THE EVENT

On 10/15/90 at approximately 1420 CDT, Unit 1 was in the Run mode at an approximate power level of 2436 CMWT (approximately 100% of rated thermal power). At that time, plant operations personnel noticed an increase in generator (EIIS Code TB) output on the digital display in the Main Control Room (EIIS Code NA). Indicated generator output increased from approximately 770 GMWE to approximately 805 GMWE. At the same time, feedwater heater (EIIS Code SJ) alarms were received in the Main Control Room. These conditions can be indicative of a loss of feedwater heating; therefore, operations personnel entered abnormal operating procedure 34AB-OPS-045-1S, "Loss of Feedwater Heater," and began reducing power by 20% as required by the procedure.

Operations personnel were dispatched to the feedwater heater controls to determine what, if any, problem existed. At approximately 1426 CDT, personnel reported that no problems existed at the feedwater heater controls. Operations personnel in the Main Control Room then discovered second stage MSR RSSVs 1N38-F101A and B were closed. (Above 20% of rated thermal power, the RSSVs should be open.) With these valves closed, steam usually directed to the MSRs from the main steam lines (EIIS Code SB) was sent to the high pressure turbine. Operations personnel recognized the increase in generator output had been caused by closure of the RSSVs and a loss of feedwater heating had not occurred.

At approximately 1427 CDT, the load reduction was stopped at about 1997 CMWT (about 82% of rated thermal power). Since the reason for the closure of the RSSVs was not known, operations personnel initiated an investigation to determine the cause for RSSVs closure. Personnel were sent to the Condenser Bay (EIIS Code SQ), where the valves are located, to look for problems.

By approximately 1437 CDT, with the RSSVs still closed, vibration on turbine bearing no. 3 had increased from 6 mils to 9.5 mils and vibration on turbine bearings nos. 4 and 5 had increased from 5 mils to 9 mils. Since the increase in turbine vibration caused annunciation in the Main Control Room, operations personnel entered annunciator response procedure 34AR-650-136-1S, "Shaft Vibration/Expansion Alarm." Power was then increased in an attempt to reduce turbine vibration.

By approximately 1445 CDT vibration had increased to around 11 mils. At approximately 1457 CDT, power was decreased. However, by 1503 CDT turbine vibration had increased to 12 mils and procedure 34GO-OPS-014-1S, "Fast Reactor Shutdown," was entered. As required by the procedure, recirculation pump (EIIS Code AD) speed was decreased to reduce reactor power, and at approximately 1507 CDT, with the reactor at approximately 70% rated thermal power, the reactor was manually scrammed by taking the mode switch to the Shutdown position. The main turbine was then manually tripped.

As expected following the manual scram, reactor vessel water level decreased due to void collapse caused by the rapid power reduction. Wate
level decreased to a minimum of 10 inches below instrument zero (154 inches above the top of active fuel). The level decrease resulted in automatic scram and Group 2 PCIS isolation signals. The Group 2 PCIVs closed per design. Reactor water level was restored with the RFPs. As condenser vacuum was reduced to help slow the turbine, the RFPs tripped on low vacuum. The RCIC System was then manually started to maintain reactor water level. Reactor pressure was controlled by the Turbine Bypass Valves which operated to control pressure at a maximum value of approximately 943 psig.

CAUSE OF THE EVENT

The cause of the Main Turbine High Vibration has not been determined. The turbine vendor, General Electric, has participated in the investigation and, to date, the actual cause has not been identified. A potential cause was the closure of RSSVs 1N38-F101A and B to the second-stage MSR. Closure of the RSSVs would cause a rapid drop in the temperature of the low pressure turbine inlet steam. This could result in movement of the low pressure turbine rotor in relation to the turbine shell as the two bodies of metal cooled at different rates. This could cause rubbing in the shaft seal area and an increase in main turbine vibration.

The cause of RSSV closure has not been determined. The Event Review Team (ERT) investigating the scram performed a fault tree analysis to ensure all possible causes of RSSV closure were identified and investigated. Several potential mechanical and electrical failure modes were investigated. However, testing and inspection revealed no actual mechanical and/or electrical failure which would have resulted in the valves closing.

The fault tree Analysis identified the repositioning of a switch located on a panel in the Unit 1 Turbine Building as a possible cause of valve closure. This switch is designed to lineup the MSR steam system for the MSR steam blanketing mode. The switch has two positions, "Auto" and "Steam Blanketing". When positioned to the steam blanketing mode, the RSSVs will close.

The switch repositioning was investigated as the switch was discovered to have been incorrectly labeled on 10/12/90. The switch was labeled such that when it was in the auto position the label indicated steam blanketing and vice versa. The switch was left in the correct, though mislabeled position, when the new label was applied. The switch was mislabeled because a plant drawing used to label the switch incorrectly indicated switch position.

On the day of the event, plant personnel, at the direction of plant management, were investigating the cause of an excessively high heat rate. Procedure 34GO-OPS-042-1S, "MSR Extraction Steam and Heater Shell Drain System" lists the normal position of the switch as "auto". It was postulated that personnel may have noted its labeled position did not match the procedure-required position and may have repositioned the switch to meet procedural requirements and to eliminate a possible source of the excessive heat rate.

However, the ERT members, at approximately 1900 CDT on 10/15/90, about four hours after the event, found the switch in its correct, although mislabeled, position. In addition, control room personnel were interviewed with regard to repositioning the switch. Further, personnel involved in the heat rate investigation were also interviewed to determine if the switch had been repositioned. The results showed that the postulated repositioning could not be confirmed.

REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

The event is reportable per 10 CFR 50.73(a)(2)(iv) because an unplanned

manual actuation of the Reactor Protection System (RPS) occurred. Subsequent to the manual scram, an RPS actuation and an isolation of Group 2 PCIS valves occurred on low reactor vessel water level due to the expected void collapse following the manual scram. The reactor was manually scram med as part of a procedurally controlled fast reactor shutdown made necessary by high turbine vibration.

High turbine vibration is indicative of a problem with the main turbine. If the high vibration is allowed to continue, severe damage to the turbine can result; therefore, it is important to quickly reduce vibration (e.g., by tripping the turbine). In this event, a manual scram was inserted per procedure 34GO-OPS-014-1S and prior to tripping the Main Turbine as a matter of good operating practice. Insertion of the manual scram precluded an automatic scram, which would have resulted from tripping the Main Turbine and resultant closure of the Turbine Stop Valves, at greater than 30% rated thermal power.

As expected, reactor vessel water level decreased due to void collapse following the manual scram. This resulted in an RPS actuation (scram) and an isolation of Group 2 PCIS valves on low reactor water level. All systems functioned per design. Water level decreased to approximately 10 inches below instrument zero. Normal level is approximately 36 inches above instrument zero. This is well above the actuation setpoint of the High Pressure Coolant Injection System (EIIS Code BJ) which is approximately 35 inches below instrument zero. Therefore, no Emergency Core Cooling Systems actuated or were needed. Water level was restored using the RFPs. When the RFPs tripped on low vacuum, RCIC was manually started to maintain water level.

The Turbine Bypass Valves operated per design and maintained reactor pressure below approximately 943 psig. No Safety Relief Valves actuated nor were any required to actuate. Based on the above discussion, it is concluded this event had no adverse impact on nuclear safety. This analysis is applicable to all power levels.

CORRECTIVE ACTIONS

The wiring to the steam blanketing switch was removed on 10/17/90. This was done under an approved Design Change Request (1H90-204) because the MSR steam blanketing mode is no longer used at Plant Hatch.

An As Built Notice was issued against the drawing which contributed to the switch being mislabeled.

ADDITIONAL INFORMATION

No systems other than the Main Steam system, the RPS, and the PCIS were affected by this event.

No component failures caused or resulted from this event.

There have been two previous similar events in the last 2 years in which a unit was manually scrammed. These events were reported in LER 50-366/1988-024 dated 1/18/89 and LER 50-321/1990-012 dated 7/10/90. Corrective actions for these events would not have prevented this event, because the manual scrams were inserted for unrelated situations.

There was a previous similar event in which Main Turbine high vibration caused a turbine trip and an automatic reactor scram. This event was reported in LER 50-321/1990-020. In that event, the RSSVs received a signal to close as reactor power was decreased below 20%. This is per design; however, only one RSSV closed. This created a thermal imbalance within the low pressure turbine leading to high vibration and a subsequent turbine trip and reactor scram. The cause of the RSSV not closing was its torque switch being set too low. The corrective actions for that event would not have prevented this event because the causes were different.

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November 8, 1990

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PLANT HATCH - UNIT 1
NRC DOCKET 50-321
OPERATING LICENSE DPR-57
LICENSEE EVENT REPORT
MANUAL SCRAM DUE TO MAIN TURBINE HIGH VIBRATION

Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(iv), Georgia Power Company is submitting the enclosed Licensee Event Report (LER) concerning a Reactor Protection System actuation and ESF actuation as a result of a manual reactor scram due to main turbine high vibration. This event occurred at Plant Hatch - Unit 1.

Sincerely,

W. G. Hairston, III

JKB/eb

Enclosure: LER 50-321/1990-021

c: (See next page.)

Georgia Power

c: Georgia Power Company
Mr. H. L. Sumner, General Manager - Nuclear Plant
Mr. J. D. Heidt, Manager Engineering and Licensing - Hatch
NORMS

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